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# Synergistic Impacts of Modern Technology and Information and Communication Technology (ICT), in Educational System

**David, Caleb Ifeanyichukwu; Muhammad Turaki Aliyu; Mohammed Tijjani Ahmed; Fatima Maikudi Abubakar**

Department of Computer Science, School of Communication & Information Sciences, A.D Rufa'i College of Education, Legal and General Studies Misau, Bauchi State Nigeria.

Corresponding Author: *calebifeanyichukwu25@gmail.com*

## *Abstract*

The Information and Communication Technology (ICT) in Education is an instrument par excellence that a nation can rely upon to bring about self-reliance. Present era is of technology and among the technology, Information and Communication Technology (ICT) is the most important. It is a power and playing critical and vital role in all aspect of human life. It has integrated the world and changed the entire global economic, social, political and educational system. The use of Information and Communication Technology (ICT) has caused many changes in the society. In the last decades, the field of education has been affected positively by these changes as contemporary generation of learners grew up and is comfortable in a digital world, and the major ideology of policies that supported the introduction of ICT in education was that they can become catalysts for good change. Technology in the other hand, has revolutionized the field of education, it is the mother of civilizations, of arts and of sciences. Technology has certainly changed the way we live. It has impacted different facets of life and redefined living. Consequently, this paper examines the synergistic impacts of the modern technology with information and communication technology (ICT), in the educational system, its application to teaching and learning process, and challenges associated with it. Positive and negative impacts of applying both ICT and the modern technology. The paper is a review paper, secondary data were used and the data were collected using secondary sources which are mostly journals and published research articles. The paper deduced that there are positive synergistic impacts of both modern technology with information and communication technology (ICT), in the educational system notwithstanding.

**Keywords**: Modern Technology, ICT, Education, Synergistic, Teaching, Impact, Learning.

# Introduction

The Technology, today, plays a very important role in our life. It is seen as a basis of growth of an economy. An economy which is poor in technology can never grow in today's scenario, this is a result of how much easier and faster technology has made our work. Every potential subject is affected by technology, and education is one of them (R. Raja *et al.,* 2018). Information Communication Technology (ICT) is a modified term of Information technology (IT). It is modern and dynamic in nature and provides access to information through telecommunication. From the past few decades, it has provided society with vast array of communication capabilities and converted society into global village. It stresses the role of intelligent building management system through unified communications and integration of telecommunications, computers, internet, software's, middleware, storage, wireless network, mobile, instant messaging, audio, video conferencing, social networking (Facebook), voice over IP (VoIP) and other communication mediums (S. M. Tariq Zafar, 2019).

The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning and research (Yusuf, 2005). Principles of teaching and learning have been generally redefined by the recent trend in ICT. Teachings, according to Fakoya and Ayoola (n.d), can no longer be done the same way as in the 19th and 20th centuries. For many years, courses have been written around textbooks. It focused on the teachers and instructors as the "sage on the stage" who disseminates information through lectures and presentations interspersed with tutorials and learning activities designed to consolidate and rehearse the content. Contemporary settings are now favouring curricula that promote competency and performance (Bello, Ganiyu A. *et al.,* 2016). The earlier introduction of technology to schools and classrooms met with opposition, resistance, fear, and lack of confidence in the teacher's ability to integrate it into their subject areas. But today even the teachers themselves are finding it difficult to grow, teach and research without technology use. The use of technology in the classroom allows teachers to make a smooth shift into individualized instruction and concentrate on developmentally appropriate use of technology for different age and material content (Aldridge and Goldman, 2007). The data available on the review have shown that Information and Communication Technology in the schools does the following:

- **i.** Allows cooperation and collaborative work between teachers, researchers, and academic institutions
- **ii.** Gives access to a variety of information sources, forms and types thus reducing the burden of teachers to create notes.
- **iii.** Makes learning more student-centred, problem-centred and inquiry-based, developing critical, reflective, and creative thinking

iv. Changes the roles of teachers to coaches, facilitators, and mentors
v. Offers opportunity to learn all the time and from anywhere.
vi. Reduces overcrowded classrooms
vii. Increases number of students admission (if utilized for distance education)
viii. Allows for easy and fast communication between students and teachers
ix. Increased multicultural awareness. Technology improves the teachers' ability to teach "authentic version of multicultural education" (Munoz, 2002).

Technology in the field of education is seen as an instructional delivery system, as a means of aiding instructions and also as a tool to enhance the entire learning process. Thanks to technology; education has gone from passive and reactive to interactive and aggressive (R. Raja *et al.,* 2018).

**Modern Technology in Educational System**

The use of instructional media and communication technology can help improve effective teaching and learning. Research has also shown that it makes students active learners as ICT improves students' creative thinking; critical thinking; reflective thinking; and enlarges learning community through collaboration (Yusuf and Onasanya, 2004). According to the latest insights as to how exactly modern students of today prefer to use technology and how does their learning get an impact if they use technology, it was revealed that the use of modern equipment technology and tools, the learning and interactivity of students increases. The reliance and dependence of such an innovation, that simply makes life an easy, smooth journey is completely unavoidable these days even in schools, universities and colleges. They also find it much more interactive, as well as full of interesting areas, when aided by technology. The transfer of knowledge becomes very easy and convenient, as well as effective. What this means is, that our minds now tend to work faster when assisted with the use of modern technology, be it any part of life, here we talk about education. Modern Technology in Educational System has enabled students today to make use of technology in the following ways:

i. Internet connection and round the clock connectivity
ii. Online degrees with the use of technology
iii. Digital footprint in the education sector
iv. Using projectors and visuals (R. Raja *et al.,* 2018).

**Information and Communication Technology (ICT) on Teaching and Learning Process**

Educational ICT use has enabled educator, institutions and learners to make authentic assessments across diversified range of courses, techno base pedagogies and their applications and student's strength and weakness. Educational ICT enabled the educator to find out the learning capacity of students and improve teaching practice by bringing modification through using educational ICT. Through the use of educational ICT educator can assess student's performance, motivation, academic interest, attitude, behaviour and quest of learning minutely and can compare it with the set parameters. Base on finding educator can guide students for

improvement and can provide students clear and transparent report of their progress and skills (S. M. Tariq Zafar, 2019). ICT has had a major impact on the education sector, on organization and on teaching and learning methods. Yet there are considerably different ICT expenditure levels between institutions within the country. Some schools have embedded ICT into the curriculum, and demonstrate high levels of effective and appropriate ICT use to support teaching and learning across a wide range of subject areas. However, some other schools are in the early phase of adopting ICT, characterized by important enhancements of the learning process, some developments of e-learning (ICT-enabled learning), but without any profound improvements in learning and teaching (Butcher, 2003). Information and Communication Technology can be defined as computer-based tools and techniques for gathering and using information. It encompasses the hardware and software, the network and several other devices (video, audio, photographic camera, etc.) that can convert information, images, and sound into common digital form. It includes electronic information in processing technologies such as computer and internet, as well as fixed-line telecommunication networks. ICT is an eclectic application of computing, communication, telecommunication and satellite technology (Yusuf, 2000).

**Literature Review**

According to Cabero (2001), integration of ICT into teaching and learning processes contributes to increase in information and reception. Such possibilities suggest changes in the communication models and the teaching and learning methods used by teachers, giving way to new scenarios which favour both individual and collaborative learning. The use of ICT in educational settings acts as a catalyst for change in this domain. ICTs, by their very nature, are tools that encourage and support independent learning. Students using ICTs for learning purposes become immersed in the process of learning and as more and more students use computers as information sources and cognitive tools (Pulkkinen, 2007), the influence of the technology on supporting how students learn will continue to increase.

Okwudishu (2005) discovered that the unavailability of some ICT components in schools' hampers teachers' use of ICTs. Lack of adequate search skills and of access points in the schools were reported as factors inhibiting the use of the Internet by school teachers. The absence of ICT equipment in most Nigerian schools leads students to resort to cybercafés for Internet access. Most cybercafé clients in Nigeria are students.

Tinio (2002) asserted that ICT has a tremendous impact on education in terms of acquisition and absorption of knowledge to both teachers and students through the promotion of: Active learning, Collaborative and Cooperative learning, Creative Learning, Integrative learning, and Evaluative learning (R. Raja *et al.,* 2018).

Carlson (2000) cited the issue of integrating technology with instruction as the single most important issues facing higher education. He further reviled that academe is still lagging behind society at large in the application of some technology trends such as personal digital assistance devices that campus has not been able to integrate into their campus networks.

Ascough (2002) considered that good education requires an awareness of the opportunities and limitations of the mode of education (S. M. Tariq Zafar, 2019).

Okebukola (2007), cited by Aduwa-Ogiegbaen and Iyamu (2008), concludes that the computer is not part of classroom technology in more than 90 percent of Nigerian public schools. This implies that the chalkboard and textbook continue to dominate classroom activities in most Nigerian schools. The Federal Ministry of Education has launched an ICT-driven project know as School Net (Federal Republic of Nigeria, 2010), which was intended to equip all schools in Nigeria with computers and communications technologies.

Baba (2014) stated that questioning if technology works is almost the equivalent of saying 'Do textbooks work?' Yes, some textbooks 'work,' in some conditions, with some teachers, with some students, but these same textbooks may not 'work' in another educational context and the same goes for technology use. Answering the question of technology's effectiveness in teaching and learning requires a clear definition of our expectations, "how we measure success, and how we define effectiveness." (Fulton, 1998) Most educational researchers, especially those who have examined large numbers of studies (meta-analyses), agree that if used appropriately, technology can improve education in the effect-size range of between 0.30 and 0.40 (Kulik, 2002).

Moursund (2005) stated that ICT brings some very powerful aids for translating theory into practice. Two of these aids are computer-assisted learning and distance education. These days, computers with internet connectivity have become common household items. Students often have access to communication tools and reference materials including e-mail, web, encyclopaedia, blogs, books, podcast and other reference materials, it is evident that ICT incorporates and extends some of the power of reading, writing and arithmetic. It facilitates the automation of many mental activities. ICT has proven to be a valuable aid to solve problems and accomplishing task in education, business, industry, science and many other human endeavours.

Yusuf (2005), also cited that ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change.

Braisford (1995) in Bamigboye, Aderibigbe and Buraimo (2007) described four important components of SOTL to include: Constructivism, Situated Learning, Motivation, and Transfer of Learning. Each of these is important to all teachers and students at all levels and in all academic discipline.

Researchers have found that typically the use of ICT leads to more cooperation among learners within and beyond school and there exists a more interactive relationship between students and teachers (Grégoire et al., 1996).

Chau (2010) that education will no longer be about learning, but reaching economic goals that are set by the experts with an increasing number of them acting more like corporate executives than educators. Swati Desai (2010) argues the role of ICT in transforming teacher centred learning to competency-based learning and found that role of ICT in the education is recurring and unavoidable.

Keengwe and Georguna (2013) argued that integration of technology into education could meet the needs of the Millennials as the generation currently attending universities; they

further said that technology should not drive instruction, but should rather be integrated into the curriculum as technology is not a substitute for good instruction.

Verene (2013) explains that technology does not look back, but promises better future. He further said that with technology we can do better whatever we want to do is a bluff as it creates the impression that there is almost nothing that is not possible with technology, Olivier (2014) found that theology took up the challenge to utilise the printing press and should do the same with the new technology.

The ICT is now a global phenomenon. It has been embraced all over the world due to its importance. Governments all over the world are harnessing the rich potentials of ICT and are using ICT as a tool for educational developments, economic recovery and wealth creation, it is very useful in tackling the ills and problems facing the educational system. Today, no nation can attain its height educationally, economically and socially without ICT (Lebow, 1993).

According to Shavinina (1997), domain-specific educational multimedia is directed to knowledge acquisition skills development in the language arts, history, physics, literature, biology and so on. There is no doubt that ICT provides productive teaching and learning experiences in order to increase people's creative and intellectual resources especially in today's information society. Through the simultaneous use of audio, text, multicolor images, graphics, motion, ICT gives ample and exceptional opportunities to the students to develop capacities for high quality learning and to increase their ability to innovate.

The extensive developments in Information and Communication Technologies have made impact in all sectors of the society, including institutional payments management. This has seen the proliferation of numerous web applications bearing various functionalities such as health records management, business records management, registration operations, payment for services and much more are done using the web. It is now mandatory for learning institutions across the globe to declare their payments for services offered at each needed moment to for the purposes of enhanced decision making based on factual payment patterns. However, this when done manually as it is at the present moment is associated with multiple fallacies inherent in manual systems (Mary Nyondo, and Nsama Lameck, 2020).

**Some Advantages of Modern Technology**

- **i.** It makes students more excited to learn.
- **ii.** Help students with busy schedules, freedom to work at home on their own time.
- **iii.** Train students to learn new technology skills they can use later in the work place.
- **iv.** Decrease paper and photocopying costs, promoting concept of "green revolution" (R. Raja *et al.,* 2018).

**Some Disadvantages of Modern Technology**

- **i.** Many experts and experienced people say that, due to such technology in education, students' imagination is affected, their thinking ability is reduced.
- **ii.** Sometime it's also time-consuming from teacher's point of view.
- **iii.** It is costly to install such technology.
- **iv.** There can be health issues too when used over limit.

v. Some students can't afford modern computer technologies (R. Raja *et al.,* 2018).

**Positive Information and Computer Technology (ICT) Impact in Educational System**

By adopting ICT teachers become more collaborative, competitive and futuristic and extended learning beyond the classroom. By using educational ICT educators became able to create learning communities in which educator, fellow educators of the institutions, educators and experts in various discipline from other institutions and across the world, students, parents, local's community organizations, museums, libraries and alimony programs are active participant. Educational ICT uses enhanced collaboration and enabled educator to develop standard pedagogy, specialized curriculum, teaching methodology, course content and other supportive materials. The ICT educator have become global, they are not only mentoring their institute students, but they are also mentoring learners across the world. They became able to prepare pedagogy professionally, became able to rethink, readjust, redesign and revise their course content and study material along with instructional approaches, techniques, tools, skills and their respective expertise. By using the ICT, they became collaborative engineer, architect of learning experience, a guide and a change agent. By using educational ICT like videoconferencing, online chat, collective social media sites, educators are integrating, coordinating, and collaborating rural and urban learners with experts and peers and making classroom learning relevant and authentic. ICT provided platform to the academic participants and encouraged them to invest in it personally and developed their teacher leadership plans. ICT converted traditional education and knowledge society into knowledge economy and enhanced the skills of educators and learners. ICT reduced the cost of educational material and enabled students to adopt rapidly changing technological environment with ease, they became able to use technology to explore opportunities and shape their lives, their community and the world. The use of net has enabled the sharing and easier accessibility of books and scientific books which has increased students' knowledge and learning. Introduction of ICT in classrooms has impacted positively, digital boards attractive features have improved learning base of students. Present world is moving on technology and expected future is the same. Expecting things without technology is impossible. One of the greatest achievements of educational ICT is that it converted world into village and helped education to penetrate deep in society at low cost with ease in the form of distance education and online education (S. M. Tariq Zafar, 2019).

**Negative Impact of Information and Computer Technology in Educational System**

The ICT is general purpose technology (GPT) and is considered as immature by nature and it needs to be specified to meet the needs expressed by the students. Before adopting ICT fully, it is needed to explore its possibilities, potentialities, accessibilities and reliabilities by the academic institutions. Due to access technology unwanted, baseless and fake information are also on rise and impacting learners and researchers. Maximum study materials are available in short and for more they charge high cost. Frequent change in technology also impacts negatively as users have to pay for advance version. Instructor cannot adopt and afford the cost of frequently changing ICT gadget, and also, they are not clear about the benefit of the

technology. Frequently changing technology and software's also de-motivate educator as they have to invest time in preparing the course content according to the new technology and software. Apart from educative information and study material accessibility many social damaging information's and video materials (pornography) are available on net and have impacted society very drastically. ICT has also created digital divide; students have computer and other facilities in institutions but not at home and poor nation's institutions do not have proper facilities in institutions and students do not have any technical excess at home. Technology converted world into village but created distance among the society, due to increase technology society lost human relation and converted responsibilities into opportunities. Learners highly depending upon ICT lose their analytical skills, mathematical skills and judgmental skills (S. M. Tariq Zafar, 2019).

**Some Challenges Associated with Application of ICT to Teaching and Learning Process**

Integrating the use of information and communication technology (ICT) into teaching and learning process places new and extra demands on teachers. Teachers need extra time to learn the use of new technologies and software for effective use of such. Upward wave of technological development also demands that teachers learn to create new things for teaching to meet up with greater expectations being placed on them. In order to promote professional development in integrating ICT into teaching-learning process, there is need for training and re-training of teachers. For teacher to confidently apply new technologies to teaching-learning activities, they must be well trained. Integrating the use of ICT into teaching and learning process at all levels of education is not without its attendant challenges. The problem most often noted by educationists is concerned with cost of procurement and maintenance of ICT equipment and facilities. Teachers, in Reid's (2002:3) study observed problem of "maintenance of equipment needed to operate a technologically enhanced school". Effective application of ICT to teaching and learning process demands that both teachers and students have access to computers and the internet outside the classrooms. Disparities between students who have access to the ICT facility and those who do not pose a challenge. For instance, blogging may not be adequately successful when parts of the student's population do not have access to the internet at home (Bello, Ganiyu A. *et al.,* 2016).

**Methodology**

Educational institutions across the world are passing through a transformation period. To meet out the social and commercial expectation of stakeholder's government took several initiatives to strengthen and fulfill the demand of technology based, futuristic and carrier-oriented education (S. M. Tariq Zafar, 2019). The paper is a review paper that uses secondary data. The data were collected using secondary sources which are mostly journals and related research articles.

**Factors Affecting Technology in Education**

Jung talks about the enormous challenge teachers are facing in our society due to the rapid expansion of knowledge. The modern technologies are demanding that teachers learn how to

use these technologies in their teaching. Hence these new technologies increase the teachers' training needs. Gressard and Loyd (1985) asserted that teacher's attitudes toward computers are a key factor in the successful implementation of ICT in education. They pointed out that teachers do not always have positive attitudes towards computers and their poor attitudes may lead to a failure of the computer- based projects also, the most commonly cited barriers are:

i. lack of time;
ii. lack of access;
iii. lack of resources;
iv. lack of expertise and
**v.** lack of support.

Another barrier given by Butler and Sellbom (2002) and Chizmar & Williams (2001) is reliability. Reliability included hardware failures, incompatible software between home and school, poor or slow internet connectivity and out of date software which are available mostly at school while the students/educators are having more up-to-date software at home.

**Recommendations**

Technology investment is not one-time expenses it is a recurring expense, when devises reach the end of life then infrastructure equipment's becomes obsolete and thus needed to be replaced or upgraded. The focus on training teachers in advance skills and introducing creative and innovative pedagogies, developing ICT infrastructure and establishing institutional network, improvising collective standard of education by minimizing the digital gap and in quality of education between rural and urban populace is highly recommended by this paper. Educational system is holistic in nature and need leadership and for the purpose of achieving it collaborative efforts must be implemented. Objectivity of ICT must be to foster self-paced, self-assessed and self-directed learning and developing futuristic policies for academic growth and social equity. In order to harness the synergistic impacts of modern technology and information and communication technology (ICT), the government should ensure that ICT policy statements are translated into reality, an ICT policy implementation commission should be created. This commission should be funded and given the power to provide ICT facilities in the schools and monitor their use regularly.

**Conclusion**

The synergistic impacts of modern technology and information and communication technology (ICT) in the educational system positively, cannot be over emphasized more specially, on teaching, learning, and research et cetera. In the other hand, the negative impacts notwithstanding, the importance of integrating the use of modern technology and ICT into classroom teaching and learning process cannot be over emphasized too. Application of modern technology and ICT to classroom situations makes teaching learner-centered. However, the challenges associated with the use of modern technology and ICT in teaching and learning process must be carefully considered and handled for effective and successful utilization of these technological facilities into teaching and learning process. The modern

Technology has a positive impact on education and at the same time may also pose negative effects. Teachers and students should take advantage of this in the good light and eliminate the demerits which are pulling back many students as well as schools from achieving excellence in teaching and learning process. Consequently, it is time for every country to introduce a more technologically equipped education sector.

## Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

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